

REMARKS

In order to emphasize the patentable distinctions of applicants' invention over the prior art, claim 1 has been amended to require that the magnetic core have a linear B-H characteristic with a permeability that is constant within an applied field between -15 Oe and +15 Oe and at a frequency range up to about 1000 kHz. Claim 2 has been amended, for the sake of clarity, to correct an obvious typographical error, viz. the duplication of the word "about" in the second line, and to recite that the saturation induction of the amorphous metal alloy used in constructing the present magnetic core has a saturation induction exceeding about 10 kG. Claim 3 has been amended for the sake of clarity to recite that the alloy in the magnetic core is in the form of ribbon wound into a toroidal shape to produce said core. Claim 4 has been cancelled to expedite prosecution. For the sake of clarity, claim 5 has been amended to depend from claim 3, instead of the now-cancelled claim 4, and to recite that a first copper winding is present on the magnetic core. Claims 6 and 7 have been cancelled to expedite prosecution. Claim 8 has been amended to recite a current transformer comprising the inductor of claim 5 and an additional copper wire winding on the core. The additional winding is adapted to carry an electrical current to be measured. Claim 9 has been amended to recite a current transformer comprising the inductor of claim 5 and an additional copper wire inserted into the hollow geometrically center section of the toroidally shaped core. Each of claims 10 and 11 has been amended to recite that the first copper winding is adapted to be connected to a voltmeter for measurement of the electrical current in the additional wire winding and additional wire, respectively. New claim 12 has been added to provide adequate coverage for applicants' contribution to the art. Claim 12 recites a preferred amorphous iron-based alloy having a composition that consists essentially of about 70-87 atom percent iron of which up to about 20

atom percent of iron is replaced by cobalt and up to about 3 atom percent of iron is replaced by nickel, manganese, vanadium, titanium or molybdenum, and about 13-30 atom percent of elements selected from the group consisting of boron, silicon and carbon.

Support for the amendment is found in the specification, e.g. at page 3, line 18; page 3, line 35 to page 4, line 1; page 4, lines 8 – 12; page 5, lines 14 – 19 and 23 – 24; page 6, lines 3 – 8; page 7, lines 13 – 14; page 8, lines 4 – 10; and Fig. 4. Consequently, no new matter has been added.

The instant specification has been amended to set forth two related applications which were filed of even date with the instant application. Both the applications are commonly owned by the assignee of the instant application.

Applicants' invention, as recited by present claims 1, 2, 3, 5, and 8 – 12 provides a magnetic core having a linear B-H characteristic with a permeability that is constant within an applied field range between -15 Oe and +15 Oe and at a frequency range up to about 1000 kHz. The core is used in constructing an inductor and a current transformer as delineated by claims 5 and 8 – 11, respectively. Preferably the core is constructed with an amorphous iron-based alloy having a saturation induction exceeding about 10 kG.

The constant permeability of the magnetic core of the invention over a wide range of applied field and frequency enables the construction of a current transformer that exhibits high accuracy under a comparably wide range of operating conditions, compared to current transformers constructed with previously known cores and materials.

The Examiner has objected to the drawings under 37 CFR 1.83(a) as failing to show every feature of the invention specified in the claims. In particular, it is indicated that square, rectangular, and triangular shapes of the magnetic core are not depicted in the drawings. These features were recited in claim 4 as originally filed. In view of the cancellation of claim 4, it is submitted that the

objection to the drawings is now moot. Accordingly, reconsideration and withdrawal of the objection to the drawings under 37 CFR 1.83(a) is respectfully requested.

The Examiner has objected to claim 1 as being informal, in that the limitations “the level of magnetic fields” and “the frequency” are said to lack sufficient antecedent basis. Claim 1, as presently amended, recites an applied field which is between -15 Oe and +15 Oe and a frequency range up to about 1000 kHz. Applicants respectfully submit that any informality of claim 1 has been cured by the present amendment.

Objection to claim 2 has been lodged because of an informality resulting from the duplication of the word “about” in the second line. The repetition of “about” having been eliminated by amendment to claim 2, it is submitted that any informality of claim 2 has been cured.

The Examiner has objected to claim 4 as having the informality of the limitation of “the group consisting of...” In view of the cancellation of claim 4, it is submitted that the Examiner’s objection is now moot.

The Examiner has objected to claims 6 – 11 as being informal, in that the preambles of the claims are inconsistent with respect to the claims on which they are dependent. In particular, claims 1 – 5 are said to introduce a magnetic core, while claims 6 – 7 are said to introduce a combination of inductor and magnetic core and claims 8 – 11 further introduce a combination of current transformer, inductor, and magnetic core. In view of the cancellation of claims 6 and 7, this objection will be discussed with respect to remaining claims 8 – 11. Applicants respectfully traverse the Examiner’s objection. It is well established that a claim that refers to a preceding claim to define a limitation is an acceptable claim construction which should not necessarily be rejected as improper or confusing. MPEP 2173.05(f). In the present instance, applicants respectfully submit that one of ordinary skill in the art would recognize that: (i) an inductor frequently comprises a magnetic core

and (ii) a current transformer frequently comprises an inductor that includes a magnetic core. As amended, claim 5 is directed to an inductor which comprises a magnetic core as recited by amended claim 3. It is respectfully submitted that one of ordinary skill would clearly understand the ambit of claim 5 without confusion. One of ordinary skill also would, without confusion, understand claims 8 and 9 as reciting a current transformer comprising the inductor recited by claim 5. Applicants thus respectfully submit that amended claims 8 – 11 do not lack clarity or definiteness and should therefore not be subject to objection or rejection.

In view of the amendment to claims 1, 2, and 8 – 11, the cancellation of claims 4, 6, and 7, and the foregoing remarks, it is submitted that the Examiner's objections to claims 1, 2, 4, and 6 – 11 have been obviated. Accordingly, applicants respectfully request reconsideration and withdrawal of the objection to claims 1, 2, 4, and 6 – 11.

Claims 1 – 11 were rejected under 35 USC 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

With respect to claim 1, the Examiner has indicated that the limitation, "which does not change with the level of magnetic fields applied and the frequency used" is very vague and not a positive limitation. As amended, claim 1 requires that the magnetic core have a linear B-H characteristic with a permeability that is constant within an applied field between -15 Oe and +15 Oe and at a frequency range up to about 1000 kHz. Applicants respectfully submit that the limitation that permeability be constant over the claimed range of applied field and frequency is positively stated and would be clearly understood in light of the specification by one of ordinary skill in the art.

With respect to claim 2, the Examiner has indicated that the phrase “at least about 10 kG” renders the claim indefinite. Applicants respectfully disagree. It is well established that the presence of the term “about” does not generally render a claim indefinite. *W.L. Gore Assocs., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1557, 220 USPQ 303, 316 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984). As amended, claim 2 recites a magnetic core wherein the amorphous metal alloy has a saturation induction exceeding about 10 kG. This recitation finds support in the specification, e.g. at page 3, line 18, as would be understood clearly by one of ordinary skill in the magnetic materials art. Accordingly, applicants submit that amended claim 2 satisfies the statutory test of 35 USC 112, second paragraph, by particularly pointing out and distinctly claiming the subject matter regarded as the invention recited therein.

With respect to claims 8 and 9, the Examiner has pointed to the limitation “an electrical current to be monitored or measured with accuracy.” As amended, claims 8 and 9 do not include the term “with accuracy.” It is submitted that any indefiniteness resulting from the presence of the term “with accuracy” has been obviated.

Regarding claims 10 and 11, the Examiner has indicated that the phrase “adapted for measurement by a voltmeter” does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. Applicants respectfully traverse the Examiner’s objection. It is well established that an “adapted to” limitation may serve to precisely define a structural feature in compliance with 35 USC 112, second paragraph. *In re Venezia*, 530 F.2d 956, 959, 189 USPQ 149 (CCPA, 1976) and MPEP 2173.05(g). In the present instance, applicants maintain that the phrase “wherein said first copper winding is adapted to be connected to a voltmeter” in amended claims 10 and 11 properly defines a structural limitation of the claimed current transformer. That is to say, the winding is structurally configured in a manner which permits

an electrical connection to a suitable voltmeter to be effected. Such a meaning is delineated in the specification, e.g. by Fig. 4 and at page 6, lines 12 – 22, and is submitted as being readily understood by one of ordinary skill in the electrical measurement art. Even if, *arguendo*, the subject phrase does not differentiate the presently claimed invention from a prior art apparatus, the presence of the phrase *per se* cannot be held to render the claim indefinite and properly subject to rejection under 35 USC 112, second paragraph. Under such a circumstance, which is not the case here, it is submitted that any rejection properly must be made under 35 USC 102 or 103, and not under 35 USC 112, second paragraph.

In view of the amendment to claims 1, 2, 3, 5, 8, 9, 10, and 11, the cancellation of claims 4, 6, and 7, and the remarks set forth above, it is submitted that claims 1, 2, 3, 5, 8, 9, 10, and 11 now satisfy the statutory requirement of 35 USC 112, second paragraph, by particularly pointing out and distinctly claiming the subject matter regarded as the invention. Reconsideration of the rejection of claims 1 – 11 under 35 USC 112, second paragraph, is respectfully requested,

Claim 1 was rejected under 35 USC 103(a) as being unpatentable over US Patent 6,211,765 to Ito et al. in view of US Patent 6,093,261 to Hasegawa et al.

Ito et al. provides a coil device including magnetic cores having gaps at positions opposed to each other in a formed magnetic path. A coil is wound to include at least one of the gaps. The core in the vicinity of the gap whereat the coil is placed has a leg shape expressed by a logarithmic function.

Hasegawa et al. discloses a glassy metal alloy consisting essentially of the formula $\text{Fe}_a\text{Co}_b\text{Ni}_c\text{M}_d\text{B}_e\text{Si}_f\text{C}_g$, wherein “M” is at least one member selected from the group consisting of Mo, Cr, and Mn; “a-g” are in atom percent; “a” ranges from about 30 to about 45; “b” ranges from about 8 to about 18; “c” ranges from about 20 to about 45; “d” ranges from about 0 to about 3; “e” ranges

from about 0 to about 5; and “g” ranges from about 0 to about 2. The alloy is cast by rapid solidification into ribbon and cross-field annealed to enhance its magnetic properties. A marker formed of the alloy is suited for use in magneto-mechanically actuated article surveillance systems, which are characterized by linear magnetization response in the frequency regime wherein harmonic marker systems operate magnetically.

It is respectfully submitted that neither Ito et al. nor Hasegawa et al. discloses a magnetic core having a linear B-H characteristic including a permeability which is linear within an applied magnetic field between -15 Oe and +15 Oe and at a frequency range of up to about 1000 kHz. As the Examiner has observed, Ito et al. does not disclose the linear B-H characteristic exhibited by the present magnetic core. Significantly, the magnetic properties disclosed by Hasegawa et al. are taken on a magnetic marker that is appointed for use with a magneto-mechanically actuated article surveillance system, not on a magnetic core. The Hasegawa marker is said to be an elongated strip of material, e.g. a strip having a length of about 38 mm (col. 4, lines 38 – 41). It is only this finite strip that is disclosed to have a linear magnetization response. Moreover, the linear response is said to be exhibited for magnetic fields up to 8 Oe or more applied parallel to the marker length direction. *Id.* The present invention, by way of contrast, provides a magnetic core wherein the linear B-H behavior extends to a field of ±15 Oe, or almost twice as wide a range as disclosed by Hasegawa et al. As a result of the extended range of linear B-H behavior, an accurate, linear response is maintained in a current transformer as delineated by present claims 8 – 11, which depend indirectly from claim 1. Moreover, there is no disclosure or suggestion in Hasegawa et al. that any linear magnetic behavior or constant permeability is maintained at any frequency above 66 kHz (col. 4, line 43), let alone constant permeability at frequencies up to about 1000 kHz, as required by present claim 1. Applicants therefore submit that the combination of Ito et al. and

Hasegawa et al. fails to disclose or suggest all the features of the magnetic core delineated by present claim 1.

Accordingly, reconsideration of the rejection under 35 USC 103(a) of claim 1 over Ito et al. in view of Hasegawa et al. is solicited.

Claim 2 was rejected under 35 USC 103(a) as being unpatentable over Ito et al. in view of Hasegawa et al. and further in view of US Patent 6,507,262 to Otte et al.

Otte et al. discloses magnetic cores including coiled amorphous ferromagnetic alloy strips in which at least fifty percent of the volume contains fine crystalline particles with an average particle size of 100 nm or less. The composition of the alloy essentially corresponds to the formula $\text{Fe}_a\text{Co}_b\text{Cu}_c\text{Si}_d\text{B}_e\text{M}_f$, wherein "M" is at least one of the elements V, Nb, Ta, Ti, Mo, W, Zr, and Hf; and "a-f" are in atom percent and meet the following conditions: $0.5 \leq c \leq 2$, $6.5 \leq d \leq 18$, $5 \leq e \leq 14$, $1 \leq f \leq 6$, $d+e > 18$, and $0 \leq b \leq 15$.

Significantly, Fig. 3 of Otte et al. discloses B-H loop characteristics of a number of alloys having different permeabilities. While certain of these B-H loops admittedly have a somewhat linear characteristics, any linearity persists only up to very modest values of applied field H. More specifically, all the loops show full saturation at a field strength of about 250 mA/cm. This strength may be converted to units of Oe using the conversion factors $1 \text{ mA/cm} = 0.1 \text{ A/m}$ and $1 \text{ Oe} = (1000/4\pi) \cong 80 \text{ A/m}$. A strength of $\pm 250 \text{ mA/cm}$ thus corresponds to about $\pm 0.3 \text{ Oe}$, far less than the $\pm 15 \text{ Oe}$ afforded by the core of amended claim 2. Applicants therefore maintain that Otte et al. fails to cure the deficiencies of Ito et al. and Hasegawa et al. It is respectfully submitted that even in combination, Ito et al., Hasegawa et al., and Otte et al. fail to disclose or suggest all the features of present claim 2.

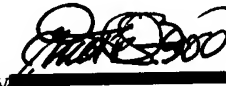
Accordingly, reconsideration of the rejection under 35 USC 103(a) of claim 2 over Ito et al. in view of Hasegawa et al. and further in view of Otte et al. is solicited.

Applicants note that the Examiner has made certain additional remarks concerning claims 3 – 11, but has not rejected any of these claims under 35 USC 102 or 103 over any prior art. It is respectfully submitted that amended claims 3, 5, and 8 – 11, which depend directly or indirectly from claim 2, are patentable for at least the same reasons as those set forth in connection with the rejection of claim 2 under 35 USC 103(a).

In view of the amendment to claims 1, 2, 3, 5, 8, 9, 10, and 11, the cancellation of claims 4, 6, and 7, the amendment to the specification, and the remarks set forth above, it is submitted that the present application is in allowable condition. Reconsideration of the rejection of amended claims 1, 2, 3, 5, 8, 9, 10, and 11, and their allowance, together with new claim 12, are earnestly solicited.

Respectfully submitted,

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